Green synthesis of iron nanoparticles using different household spices for dairy wastewater treatment

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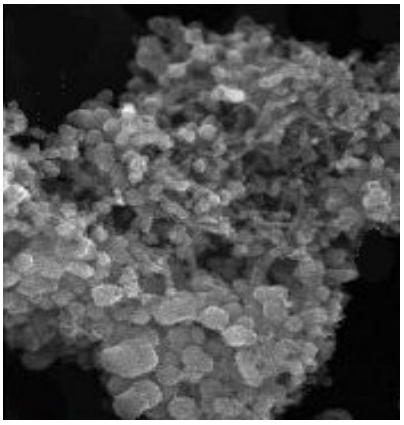
ABSTRACT

The use of plant extract is found to be a fascinating approach for cost effective and ecofriendly synthesis of iron nanoparticles.In this study, nanoparticles were synthesised through various household spices viz. Syzygium aromaticum(clove), Trachyspermum ammi(carom seeds), Murraya koenigii(curry leaves) and its potential was checked for treating dairy wastewater.Iron nanoparticles were generated by reaction of ferrous chloride solution(0.001 M) with extract of specific part of spices i.e buds, seeds and leaves respectively.The reductants present in the extracts acted as reducing and stabilizing agents.The formation and presence of nanoparticles and biomolecules which could help in capping the nanoparticles was confirmed using characterization results of UV-Vis Spectrophotometer,FT-IR and Scanning electron microscopy(SEM) analysis.In UV-Vis spectrophotometer absorption peaks were observed at 217-281 nm which are identical to the characteristics UV-Vis spectrum of metallic iron.Diameter of synthesised nanoparticles was 50-100 nm and had linear orientation.A relatively darker change in colour and decrease in pH was observed for all the three samples after addition of spices extract in ferrous chloride solution. The pH decrease was 2.43, 1.78 and 1.27 respectively. Among the different species mediated synthesized iron nanoparticles, Trachyspermum ammi showed 76.01% of Chemical Oxygen Demand removal.Overall performance of Trachyspermum ammi synthesized iron nanoparticles showed best results compared to other spices extracts for dairy wastewater treatment.



SEM image of silver nanoparticle obtained(in case of Syzygium aromaticum)

Thrust Area;Environmental Chemistry
Category; UG